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Research Article

Coverage and Determinants of Second-Dose Measles Vaccination Among Under-Five Children in Aceh Jaya District, Aceh Province, Indonesia

Cakupan dan Determinan Campak Dosis Kedua pada Balita di Aceh Jaya, Aceh, Indonesia

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A B S T R A C T

Indonesia is aiming for measles elimination status by 2020. However, high number of measles cases are still prevalent and there are still coverage differences among provinces. Measles immunization coverage also varies among surveys and routine coverage report. With the addition of second-dose measles vaccination (MCV2), measles infections in the country is expected to decrease. However, MCV2 coverage has been low after 2 years of implementation. Aceh Province was chosen for this study because its low coverage. This study aimed to measure the coverage and investigate the determinants of MCV2 in Aceh Jaya, Aceh Province. Dataset from "Assessment of the New 2nd Dose Measles Policy and the School-based Immunization Program in 2 Provinces (Aceh and South Sulawesi)" was used. There were a total of 300 children aged 25 – 37 months with coverage of MCV2 54% in Aceh Jaya District, Aceh Province. After further selection, 129 observations underwent bivariate and multivariate analysis using logistic regression. After controlling all variables, only experience of prompt service at the healthcare provider was associated with child receiving MCV2. We suggest future studies to look more into health care services and willingness to get vaccination. Additionally, with this result we hope the government could improve health care services in their facilities in order to achieve higher coverage.

Keywords: *measles, immunizations coverage, vaccination, under-five children, Indonesia.*

A B S T R A K

Indonesia berupaya mencapai target status eliminasi campak pada tahun 2020. Akan tetapi, angka kejadian campak masih prevalen dan masih ada ketimpangan cakupan antar provinsi. Cakupan imunisasi campak menunjukkan perbedaan pada survei yang dilakukan dengan laporan rutin. Dengan penambahan imunisasi campak dosis kedua, angka kejadian campak diharapkan dapat berkurang. Namun, setelah pelaksanaan selama dua tahun, cakupan campak dosis kedua masih rendah. Provinsi Aceh dipilih untuk diteliti memiliki cakupan yang rendah. Studi ini bertujuan untuk mengukur cakupan dan menginvestigasi detemninan dari campak dosis kedua di Kabupaten Aceh Jaya, Provinsi Aceh. Data didapatkan dari "Asesmen Kebijakan Imunisasi Campak Dosis Kedua dan Program Imunisasi di Sekolah (Aceh dan Sulawesi Selatan)". Dari 300 anak berusia 25 sampai 36 bulan diperoleh cakupan imunisasi campak dosis kedua sebesar 54%. Setelah seleksi variabel-variabel lebih lanjut, 129 sampel didapatkan untuk dilakukan analisis bivariat dan multivariat dengan regresi logistik. Hasil analisis menunjukkan pengalaman mendapatkan layanan yang cepat di pelayanan kesehatan yang berhubungan dengan imunisasi campak dosis kedua pada analisis multivariat. Kami menyarankan pada penelitian selanjutnya agar dapat melihat lebih dalam hubungan layanan perawatan kesehatan dan keinginan untuk mendapatkan vaksinasi. Selain itu, dengan hasil ini kami berharap pemerintah dapat meningkatkan layanan perawatan kesehatan di fasilitas mereka untuk mencapai cakupan yang lebih tinggi.

Kata kunci: *campak; cakupan imunisasi; vaksinasi; anak balita; Indonesia.*

Introduction

Measles is one of the highly contagious diseases that mainly affect children.[1,2] Although the prognosis is generally good, this particular disease could have serious complications, such as pneumonia and encephalitis which can lead to death.[1 – 4] Despite the highly contagious and potentially fatal nature, measles can effectively be prevented by vaccines.[2] Indonesia launched vaccination program for measles in 1956 and now aims to eliminate the disease by 2020.[2,5] Basic Health Research (*Riskesdas*) and Indonesia Demographic and Health Survey (DHS/SDKI) found that vaccination coverage, including measles, in Indonesia is high but diseases outbreaks including measles have occurred in several districts within the last decade.[6 – 8]

From measles case-based surveillance, it was reported that there are always more than 11,000 suspected measles cases and about 12 – 39% are confirmed measles cases in a year.[2] From 2010 to 2015, it was estimated that there were 23164 measles.[2] The estimated number of cases is still considered low compared to the actual figures in the field, considering that there are still many unreported cases, especially from private health facilities and and incompleteness of surveillance data.

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The Expanded Program on Immunization (EPI) is a health intervention program established in 1974 by World Health Organization (WHO) in response to the high infant morbidity and mortality due to infectious diseases.[9] In 1977, it set a goal to make immunization against diphtheria, pertussis, tetanus, poliomyelitis, measles and tuberculosis available to every child in the world by 1990.[9] Recently WHO set a target for measles elimination and Rubella/CRS Control by the year 2020 in South-East Asia region.[10]

Indonesia started implementing basic immunization as national immunization program as early as 1977, including first dose measles-containing vaccine (MCV1).[11] In 2002, Indonesia started school immunization for measles, and followed by second-dose measles-containing vaccine (MCV2), which started in 2014.[12, 13] With the addition of the MCV2, number of measles infection in the country is expected to decrease as Indonesia has committed to meet the target for Global Vaccine Action Plan.[2]

Measles school immunization coverage was reported successful with coverage of more than 90% since 2011, but MCV2 still had low coverage after implementation for two years, which was only 30.8%.[8,14] Furthermore, there are still provincial differences in terms of measles vaccine coverage. Provinces like West Papua, Central Kalimantan, and Aceh showed extremely low MCV2 coverage compared to other provinces.[14] Additionally, reported coverage from routine immunization data, Basic Health Research (*Riskesdas*), and Indonesia Demographic and Health Survey (DHS/SDKI) have shown discrepancies.

With high annual number of cases and varied coverage among surveys and reports, it is indeed crucial to investigate the coverage and determinants of MCV2 in Indonesia, especially in provinces with low reported coverage. Therefore, this study aimed to measure the coverage and investigate the determinants of MCV2 in Aceh Jaya, Aceh Province.

Methods

This study used dataset from "Assessment of the New 2nd Dose Measles Policy and the School-based Immunization Program in 2 Provinces (Aceh and South Sulawesi)" survey.[15] Data collection of the survey was done from March 6th to 20th, 2017, using interviewer-administered questionnaire in both Aceh Province and South Sulawesi Province. The survey used a rapid survey on immunization coverage referred to the WHO Immunization Coverage Cluster Survey: Reference Manual.[16] Target population included children age 24 to 36 months and school-age children, whereas the respondents were parent or caretaker of the children. Minimum sample size was calculated for each children group using Lemeshow's formula.[17] The study anticipated 20% immunization coverage with 7% precision and 95% confidence. A design effect of 2 was used for cluster sampling yielding a minimum of 252 respondents. Due to geographic spread and population size, 30 clusters, with 10 children per cluster, were considered optimal to meet the minimum respondents thus resulting in 300 children for children age 25 – 37 months old and 300 children for school-age children. The study had no household list thus after randomly selecting 30 clusters in the district, 10 households in each cluster was done by determining the starting point of the survey in the village based on major and minor intersections within the selected village using a village map. Further description of this method can be found elsewhere.[18] The questionnaires used in the study were developed from sample immunization coverage survey forms from WHO Immunization Coverage Cluster Survey: Reference Manual then adapted to fit the Indonesian situation.[16] Items regarding history of immunization were asked to the respondents then checked with Mother and Child Health Book or immunization card for validity if one of these records was available.

This study only focused on MCV2 among 25 – 37 months old children in Aceh Jaya District, which is one of the four districts in the survey. Variables extracted from the dataset were MCV1 and MCV2 status of the children, children's gender, children's age, vaccination record ownership, exposure of MCV1 and MCV2 information, socioeconomic factors (education of parents, occupation of parents, television ownership, car ownership), knowledge of MCV, experience of MCV, and support received regarding MCV. In the survey, MCV1 and MCV2 statuses were asked to parents/caretakers and then confirmed with the record in their Mother and Child Health Book or other vaccination card. Age of parents/caretakers were confirmed with their national identity cards and/or family cards. Age of children were confirmed with Mother and Child Health Book or other vaccination card. Other variables were asked to parents/caretakers thus there might have been recall bias in the survey. The variables were first presented descriptively. Due to missing data, only 129 respondents were included in bivariate analysis and multivariate analysis with logistic regression. Statistical analysis was done on STATA version 12.1.

Results

There were 300 observations available for 25 – 37 months children in Aceh Jaya District in the dataset. The average of children's age was 31 months old with 25 months old the youngest and 37 months old the oldest child. Almost all respondents were parent of the child (98,3%) and the average age of the respondents was 32 years old and ranged from 18 years old to 70 years old. A large percentage of the respondents were

female (78,7%).

Table 1 below shows the characteristics of selected children age 25 – 37 months in Aceh Jaya District, Aceh Province. The largest percentage of parents' education were senior high school graduate, 36.3% for mothers and 42.7% for fathers. More than half of mothers are unemployed or housewife (65.0%), while a little less than half of all the fathers are entrepreneurs or merchants (46.3%).

Table 2 presents characteristics related to measles vaccination of the children. About half of the children age 25 – 37 months old in Aceh Jaya (54%) received MCV2 as reported by the respondents with large percentage of these children (84%) received MCV1. More than half (79.7%) of the respondents managed to proof their ownership of vaccination record in form of Mother and Child Health Book or immunization card. Around 88.3% of respondentsclaimed that they received information regarding MCV1, in which more than half of them received the information from midwives (71.7%) and then a small portion from health cares (26.8%) and others (1.5%), specifically doctors or nurses. Those who claimed that their children received MCV1 had them vaccinated at *posyandu* (79.0%) mostly. Half of respondents (71.7%) claimed that they received information regarding MCV2, in which more than half of them received the information from midwives (70.7%) and then a small portion from health cadres (27.4%) and others (1.9%) specifically doctors or nurses. Those who claimed that their children received MC2 had them vaccinated at *posyandu* (84.6%) mostly.

Tabel 1. Characteristics of 25 – 37 months old children in Aceh Jaya District, Aceh Province, March 2017

Variables	Frequency	Percentage (%)
Child's gender		
Male	151	50.3
Female	149	49.7
Mother's education		
No education	1	0.3
Did not complete primary school	4	1.3
Graduated from elementary school	51	17.0
Graduated from junior high school	88	29.0
Graduated from senior high school	109	36.3
Graduated from college or equivalent or above	47	15.7
Do not know	0	0.0
Father's education		
No education	3	1.0
Did not complete primary school	8	2.7
Graduated from elementary school	54	18.0
Graduated from junior high school	81	27.0
Graduated from senior high school	128	42.7
Graduated from college or equivalent or above	25	8.3
Do not know	1	0.3
Mother's occupation		
Unemployed/housewife	195	65.0
Military/police	3	1.0
Civil servant/employee	43	14.3
Entrepreneur/merchant	29	9.7
Farmer	22	7.3
Laborer	0	0.0
Other	8	2.7
Father's occupation		
Unemployed	1	0.3
Student (in school)	1	0.3
Military/police	9	3.0
Civil servant/employee	29	9.7
Entrepreneur/merchant	139	46.3
Farmer	92	30.7
Fisherman	14	4.7
Laborer	9	0.0
Do not know	6	2.0
Television ownership		
Yes	263	87.7
No	37	12.3
Car ownership		
Yes	28	9.3
No	272	90.7

Tabel 2. Characteristics related to measles vaccination of 25 – 37 months old children in Aceh Jaya District, Aceh Province, March 2017

Variables	Frequency	Percentage (%)
MCV2		
Yes	162	54.00
No	126	42.00
Do not know	12	4.00
MCV1		
Yes	252	84.00
No	40	13.33
Do not know	8	2.67
Vaccination record (Mother and Child Health Book/immunization card)		
Yes	239	79.67
No	61	20.33
Received information regarding MCV1		
Yes	265	88.33
No	35	11.67
Informed by (n=265)		
Midwife	190	71.70
Health cadre	71	27.73
Others	4	1.17
If vaccinated MCV1, location of vaccination (n=252)		
Posyandu	199	78.97
Puskesmas	46	18.25
Private health facility	4	1.59
Others	3	1.19
Received information regarding MCV2		
Yes	215	71.67
No	85	28.33
Informed by (n=215)		
Midwife	152	70.70
Health cadre	59	27.44
Others	4	1.86
If vaccinated MCV2, location of vaccination (n=162)		
Posyandu	137	84.57
Puskesmas	21	12.96
Private health facility	3	1.85
Others	1	0.62
Know about measles vaccination in general		
Yes	175	58.33
No	125	41.67
Know about MCV1		
Yes	175	58.33
No	125	41.67
Child's age to receive MCV1		
Know (9-11 months)	172	57.33
Do not know	128	42.67
Know about MCV2		
Yes	172	57.33
No	128	42.67
Child's age to receive MCV2		
Know (24-36 months)	106	61.63
Do not know	66	38.37
Comfortable when child is injected vaccine		
Yes	235	78.33
No	65	21.67
Experience prompt service at healthcare provider		
Yes	247	82.33
No	23	7.67
Do not know	30	10.00
Family informed about measles vaccination to parent/s of child		
Yes	139	46.33
No	161	53.67
Family accompanied parent/s to have child vaccinated against measles		
Yes	137	45.67
No	125	41.67
N/A	38	12.67
Family give transportation support parent/s to have child vaccinated		
Yes	219	73.00
No	81	27.00
Family motivated child's parent/s to have the child vaccinated against measles		
Yes	216	72.00
No	84	28.00

Half of parents/caretakers know about measles vaccine in general (58.33%). About half of parents/ caretakers know about MCV1 (58.33%) and know the correct age for children to receive MCV1 (57.33%). Half of parents/caretakers know about MCV2 (57.33%) and a little more than half know the correct age for children to receive MCV2 (61.63%). Most parents/caretakers are comfortable when their children are injected with vaccines (78.33%). Most parents/caretakers also claimed that they have experience prompt service at healthcare provider previously (82.33%).A little less than half of parents/caretakers were informed about measles vaccination by family (46.33%). A little less than half of parents/caretakers were accompanied by family when they have their children vaccinated (45.67%). Majority of parents/caretakers had support from in regards to transportation to have their child vaccinated (73.00%) and were motivated by family to have their children vaccinated (72.00%).

Due to missing data, only child's gender, vaccination record ownership, parent/caregiver informed by healthcare provider regarding MCV2, mother's education, father's education, mother's employment, television ownership, car ownership, parent/caregiver's awareness of measles vaccination in general, parent/caregiver's awareness of the correct age for MCV2, parent/caregiver feels comfortable when child is vaccinated, parent/caregiver experienced prompt service at healthcare provider, family support to inform parent/caregiver to have child vaccinated against measles, family support in accompanying parent/caregiver to have child vaccinated, family's support in helping with transportation to have child vaccinated, and family's support in motivating parent/ caregiver to have child vaccinated were analysed as predictors for having child receiving MCV2. After this selection 129 participants were analyzed further. In Table 3, it is shown that only two variables have statistically significant association with MCV2 status (marked with [a]). Knowing the correct age of MCV2 and having experience of prompt service at the healthcare provider were associated with giving second dose of measles vaccine.

In addition to these two significant variables, we included other variables which yielded p-value more than 0.25, which are perception of comfort when child is vaccinated and family support (e.g. being informed and accompanied by family), transportation provision, and motivation) in the final model. From this model, only experience of prompt service remains statistically significant (marked with [b]).

Tabel 3. Bivariate and multivariate analysis results on factors associated with MCV2 among 25 – 37 months old children in Aceh Jaya District, Aceh Province, March 2017

Variable (n=129)	Total	Children who received MCV2		OR crude	CI	OR adjusted	CI
	n	n	%				
Child's gender							
Male	58	51	87.9	1.34	0.48 – 3.70		
Female	71	60	84.5	1			
Vaccination record							
Yes	115	98	85.2	0.44	0.01 – 3.36		
No	14	13	92.9	1			
Informed by healthcare provider regarding MCV2							
Healthcare provider	94	82	87.2	1.41	0.49 – 4.11		
Others	35	29	82.9	1			
Mother's education							
High	82	70	85.4	0.85	0.30 – 2.45		
Low	47	41	87.2	1			
Father's education							
High	83	71	85.5	0.89	0.31 – 2.55		
Low	46	40	87.0	1			
Mother's employment							
Employed	43	39	90.7	1.90	0.54 – 8.42		
Unemployed	86	72	83.7	1			
Television ownership							
Yes	127	110	86.6	6.47	0.39– 108.99		
No	2	1	50.0	1			
Car ownership							
Yes	22	18	81.8	0.68	0.20 – 2.30		
No	107	93	86.9	1			
Respondent is aware of measles vaccination in general							
Yes	94	79	84.0	0.49	0.13 –1.82		
No	35	32	91.4	1			
Respondent knows the correct age for MCV2[a]							
Yes	92	84	91.3	3.89	1.39 – 10.85	3.05	0.88 – 10.57
No	37	27	73.0	1		1	
Comfortable when child is vaccinated							
Yes	116	102	87.9	3.24	0.88 – 11.92	2.71	0.55 – 13.28
No	13	9	69.2	1		1	
Experienced prompt service at healthcare provider[ab]							
Yes	123	108	87.8	7.20	1.33 – 38.98	6.65	1.06 – 41.61
No	6	3	50.0	1		1	
Family informed child's parent/s to vaccinate against measles							
Yes	94	79	84.0	0.49	0.13 –1.82		
No	35	32	91.4	1			
Respondent knows the correct age for MCV2[a]							
Yes	92	84	91.3	3.89	1.39 – 10.85	3.05	0.88 – 10.57
No	37	27	73.0	1		1	
Comfortable when child is vaccinated							
Yes	116	102	87.9	3.24	0.88 – 11.92	2.71	0.55 – 13.28
No	13	9	69.2	1		1	
Experienced prompt service at healthcare provider[ab]							
Yes	123	108	87.8	7.20	1.33 – 38.98	6.65	1.06 – 41.61
No	6	3	50.0	1		1	
Family motivated child's parent/s to have the child vaccinated against measles							
Yes	110	97	88.2	2.67	0.82 – 8.62	0.83	0.16 – 4.31
No	19	14	73.7			1	

Discussion

Our study found that MCV2 coverage in Aceh Jaya District was 84% with MCV1 coverage of 54%. Both coverages are higher than the reported the results might be overestimated. Only respondents who were available in their homes were selected. Also, due to lack of sampling and use of this particular selection method, only those houses located near major intersection were selected as participants in this study.

The difference between the reported coverage from Aceh Jaya District Health Office and our study coverage results might be due to some possibilities. First, the difference could be affected by sampling bias of sample of the survey. Sampling error can contribute to unpredictable inaccuracies in a study.[19] Second, the difference was also could be affected by the use of under/overestimated denominators of reported coverage. If the denominator was very low thus the reported coverage become higher than surveyed coverage or vice versa. Additionally, those who were available at home are more likely to have been chosen for this study since the data collection were done during day time. Parents or caretakers who were available at home are most likely also those who usually have time to bring their children to *Posyandu*, *Puskesmas*, or other health facilities for vaccination.

Information bias also might have occurred during measuring information related to immunization status because most of the information depended heavily on the respondents' ability to recall the information, in particular immunization history of the child. Percentage of respondents who had Mother and Child Health Book or immunization card in Aceh Jaya District was 79.67%. Some of the immunization cards had been kept by health cadres at *Posyandu*, thus some of the respondents could not show the immunization cards during data collection of the survey. The surveyed MCV1 and MCV2 coverages were 84% and 54%, respectively. This means 4.33% of the respondents who claimed that their children received MCV1 could not be validated. Therefore, the surveyed coverage could be overestimated.

Both MCV1 and MCV2 coverages do not meet the minimum 95% coverage target for herd immunity.[2] The lower coverage of MCV2 compared to MCV1 may be due the program recent introduction. Program for the MCV2 has just started less than 5 years ago and only about 20% of respondents claimed not aware of MCV2.

Accordingly, knowing the correct age of MCV2 was statistically significant even only on bivariate analysis. However, previous studies showed that increased parents/caregivers' awareness is associated with increased vaccination coverage.[20, 21] Various studies done in other countries in Asia and Africa showed that parents/caretakers with low knowledge to no knowledge of vaccination is associated with non-vaccination of their children.[22 – 25] As mentioned previously, information dissemination regarding vaccination program is very important in assuring the success of vaccination program. The importance of health communication has been reviewed previously in polio eradication program.[26]

We have yet to find any study that specifically explores the association between promptness of health care service and patients' willingness to get vaccination. However, it is plausible that positive previous experience at healthcare provider is likely to motivate parents to get the second dose of measles vaccine for their children. Hence, we agree that it is important to ensure health facilities provide the optimal service for patients, not only the convenient wait-time, but also other components such as schedule and comprehensive explanation about the vaccination itself.

Although the rest of variables are not shown to have statistically significant association, interpretation must be cautiously made due to limited sample size. For example, out of 129 children, only three children who did not receive MCV1. A larger sample would have been more appropriate to confirm such justification.

Furthermore, although family support factors do not have statistically significant OR, the proportion of parents who get their children vaccinated with MCV2 are generally higher in those with positive family support, such as motivation, information, and act of accompanying the parents/children. Therefore, awareness, information, and education on vaccination should be made accessible to everyone, not only parents with eligible children.

There were several limitations to this study. As mentioned and explained previously, information biased might have occurred in this study. Additionally, even though sample selection was done carefully to be representative of Aceh Jaya District as much as possible, the results might be overestimated. Only respondents who were available in their homes were selected. Also, due to lack of sampling and use of this particular selection method, only those houses located near major intersection were selected as participants in this study.

Conclusion

In conclusion, our study found that MCV1 and MCV2 coverage in Aceh Jaya District in March 2017 were 84% and 54%, respectively. These coverages did not meet the minimum target of 95%. However, these coverage numbers are higher than the reported coverage from the District Health Office of Aceh Jaya District. We also found that experience of prompt service was associated with having the child vaccinated

with MCV2 though we have yet to find any study that specifically explores the association between promptness of health care service and patients' willingness to get vaccination.

According to the findings in this study, we recommend further survey with larger sample size and more specified objective to be conducted in order to obtain more reliable results from the statistical analysis. We suggest future studies to look more into positive experience in health care services and willingness to get vaccination. Additionally, with this result we hope the government could improve health care services in their facilities in order to achieve higher coverage.

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